

## DISLOCATIONS OF THE PATELLA, WITH ROTATION ON ITS HORIZONTAL AXIS.

BY WILLIAM S. CHEESMAN, M.D.,  
OF AUBURN, NEW YORK.

DISLOCATIONS of the patella with rotation on its perpendicular axis are not specially rare. In these the bone is revolved through  $90^{\circ}$ , one or other lateral edge resting in the groove between the femoral condyles (Fig. 1), or through  $180^{\circ}$ , so

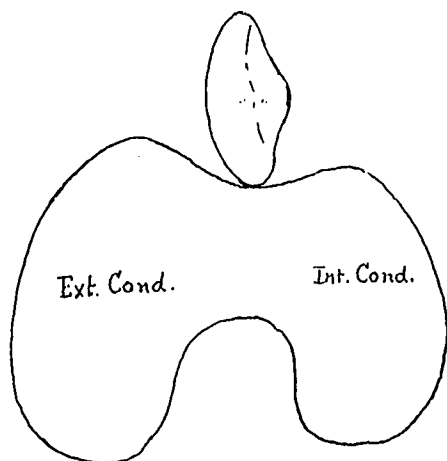


FIG. 1.—Dislocation with rotation on perpendicular axis.

that its articular facets look directly forward, the tendons of the quadriceps and ligamentum patellæ being twisted or ruptured.

But of dislocations with rotation on the horizontal axis, and the bone wedged in the notch between tibia and femur

(Fig. 2), only five cases have been reported, abstracts of which will be found below. To these I am able to add a sixth, the history of which is as follows:

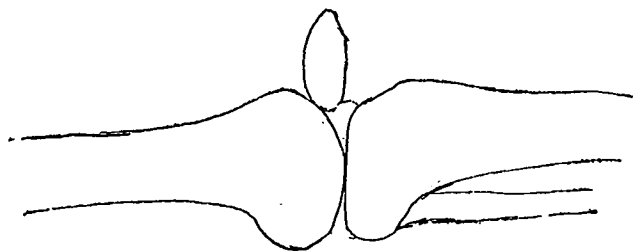


FIG. 2.—Dislocation with rotation on horizontal axis.

On Friday, July 1, 1904, Drs. Conway and O'Brien, of this city, were summoned to attend John —, aged thirteen years, who had been thrown from a moving railroad train and sustained an injury of the left knee. The patella could be plainly felt projecting

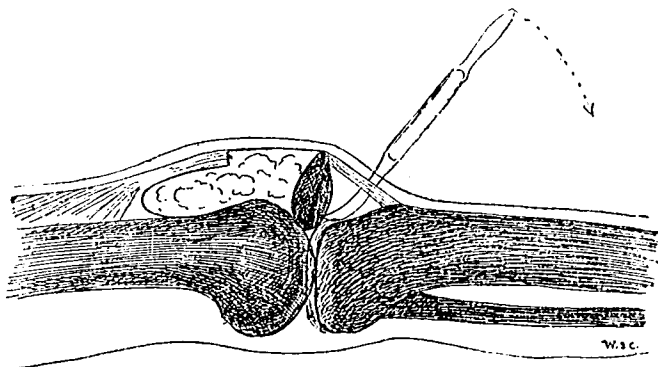


FIG. 3.—Luxation of patella on horizontal axis. Joint cavity distended with blood. Method of reduction.

straight forward from the space between tibia and femur. The fingers inserted above it entered the joint cavity, only skin and superficial tissues intervening. The leg was readily flexed and extended. (Fig. 3.)

Under chloroform all efforts to lift the patella out of its false position failed, and like ill-success attended a second trial on the following morning (Saturday). Saturday evening, at the Auburn City Hospital, Drs. Conway and O'Brien kindly referred the case to me, and with the patient chloroformed I was able fully to verify their diagnosis already made, but was likewise unable to reduce the displacement. The patella moved slightly laterally, and its engaged superior border could be felt to grate on the cartilaginous surfaces of the bones, but it could not be lifted out of its insertion between them, being evidently held there by the stretched ligamentum patellæ and the fibres of the joint capsule. It was judged that the quadriceps tendon must be ruptured, thus permitting the fingers to dip deeply into the joint above the displaced patella, and allowing full flexion of the leg. There was at the time of my examination much swelling of the whole joint. Preparations were at once made for operation, which was done the following morning, July 3.

Under ether a large semicircular flap, convexity upward, was turned down, exposing the tendinous structures of the knee. All tissues were infiltrated with blood. A longitudinal opening made in the joint above the patella gave exit to much bloody serum and clots. The joint cavity was irrigated with hot saline solution till clean. Efforts were then made by the hands and by lion-jawed forceps to lift the patella from its lock in the joint. All were unsuccessful. The bone was so firmly held by the tense ligamentum patellæ and the other tendinous structures that the grip of the lion-jawed forceps repeatedly slipped. Finally, through a slit near the ligamentum patellæ, the curved end of a blunt dissector was introduced under the patella in the manner shown in Fig. 3, and the bone pried out of its engagement in the joint, whereupon it leaped suddenly into normal position.

The upper edge of the patella hitherto hidden between tibia and femur was now seen to be completely severed from the quadriceps tendon. No particle of the tendon remained attached to it, but some bony fragments torn from the knee-pan remained attached to the tendon. A final wash-out was given the joint cavity, and the separated tendon sutured by chromicized gut to the periosteum and aponeurotic fibres of the patella. Other divided structures were similarly united, and the large flap brought into place by a subcutaneous catgut suture, a few strands of silkworm gut

being left in the lower end of the incision on either side of the joint, as a drain. Gauze dressing. Limb straight in plaster, and in bed elevated  $45^{\circ}$  to relax quadriceps.

Healing virtually reactionless. Highest temperature recorded  $100^{\circ}$  F. On the twelfth day joint examined through a window cut in the splint, and found without effusion, and the wound healed *per primam*, except where a small area of skin had sloughed at the upper border. This healed quickly. No use of joint allowed till twenty-third day, in order that union between patella and quadriceps tendon might become strong. Slight flexion was begun and patient allowed to walk. Massage. By August 8 (thirty-sixth day) flexion to right angle, and free use of joint

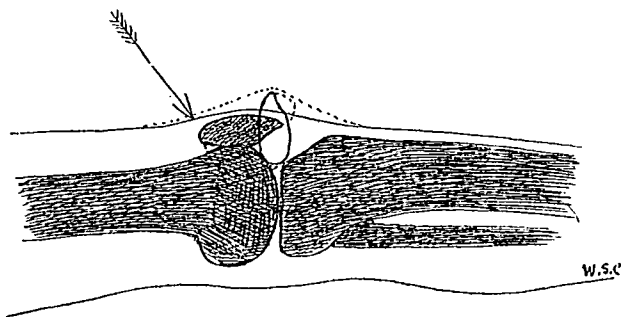


FIG. 4.—Probable mechanism of injury.

encouraged. On September 10 recovery of all motions complete. Tendon of quadriceps felt firmly united to upper border of patella.

The mechanism of the injury seems plain. Whether the leg were flexed or extended, force delivered in the direction of the arrow (Fig. 4) at point of attachment of quadriceps tendon to the patella could sever this attachment, turn the patella on its horizontal axis, and, continuing, push its freed upper border downward into the crotch between femur and tibia, where it would be locked by the patellar ligament and capsular fibres stretching like guy-ropes of a tent in all directions.

For purposes of comparison, a brief *résumé* of the other cases on record is added.

CASE I.—MIDELFART. "A Rare Dislocation of the Patella." Norsk. Mag. f. Laegevidenskaben, 1887, Vol. xlvii, p. 588.

A boy aged twelve years fell on a sharp stone, receiving what was taken by the physician first in charge for a fracture of the patella. The supposed lower fragment was felt immovably fixed, while the upper could not be found. To clear up the case, Midelfart opened the joint transversely. It then appeared that the quadriceps had been separated from the upper margin of the patella, taking with it small fragments of bone, and that the patella had been turned directly forward, articular surface downward, and forced into the space between femur and tibia, the ligamentum patellæ remaining intact.

Patella elevated into position by manipulation, and capsule and skin united by catgut. Healing by first intention. Ultimate result as to function not stated.

CASE II.—SZUMAN. Archiv f. klin. Chirurgie, 1889, Vol. xxxix. "Eine seltene Form von Patellarluxation."

February 1, 1888, F. S., aged twenty-seven years, was drawn under the cylinder of a hay-cutting machine. Limped to house, but could not extend leg, which was bent at an obtuse angle. Pain on motion. Ecchymoses, œdema, and a visible and palpable depression in place of the patella. From the space between the external femoral condyle and tibia is a sharp transverse projection (the patella). A tightly drawn cord goes from this projection to the quadriceps muscle (the quadriceps tendon), and from the foremost angle of the projection another to the tubercle of the tibia (ligamentum patellæ). (Fig. 5.)

Chloroform. Attempts at reduction failed, as the patella could not be rolled over the external condyle. Leg moved freely, and could be bent inward sharply, hence laceration of internal lateral ligament, but could not be straightened beyond  $135^{\circ}$  on account of patella wedged between the bones.

Operation through resection incision (which, not stated). After opening joint, patella could still not be gotten over the external condyle. It could be drawn forward a little, but always slipped back. Therefore cut ligamentum patellæ. Joint now gaped widely, showing patella deeply wedged between external condyle and tibia, the anterior surface looking downward, posterior surface upward. Crucial ligaments torn and capsule lacerated in several directions, notably by the sharp anterior angle of the external condyle. After several efforts, pushing the patella forward while lifting it off from the external condyle, an assistant pulling it with hooks, the bone slipped with an audible snap into normal position.

Joint drained; ligamentum patellæ sutured with catgut; crucial not sutured, as they seemed to lie well together; splint and elevation. Afebrile course. Splint continued several weeks; two months later knee gave  $20^{\circ}$  motion.

CASE III.—DEADERICK. "Case of Rupture of Quadriceps Femoris Tendon with Dislocation of Patella beneath the Intercondyloid Groove of the Femur." ANNALS OF SURGERY, 1890, Vol. xi, p. 102.

Youth aged nineteen years, fell while trying to board a train, and dislocated left patella. Bone torn loose from upper attachment, and turned on lateral axis three-eighths of a circle, its longitudinal axis forming an angle of  $45^{\circ}$  with the tibia. Chloroform. Strenuous efforts made at reduction, but all failed, as did others made next day. How strenuous were these efforts appears from the fact that a four-pronged steel hook was in-

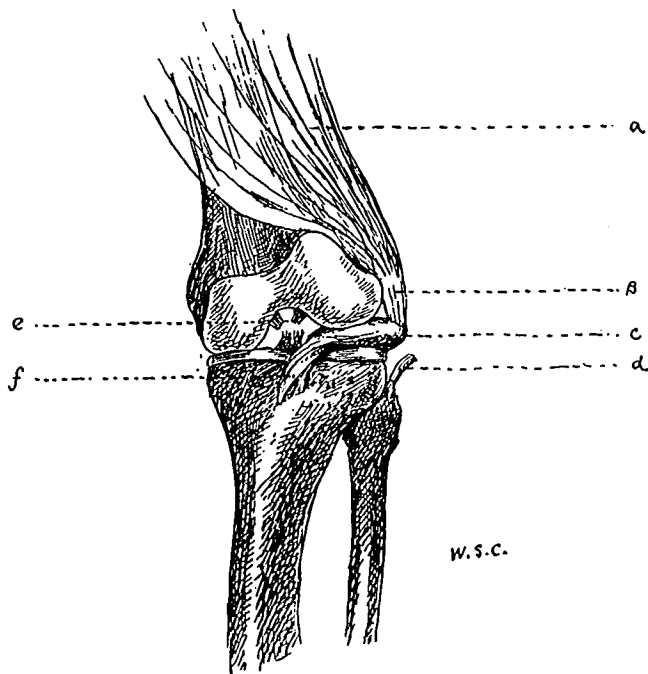


FIG. 5.—Szuman's case, reproduced from illustration accompanying his report. *a*, Quadriceps extensor; *b*, quad. extensor tendon; *c*, patella; *d*, ruptured ext. lateral lig.; *e*, ruptured crucial lig.; *f*, lig. patella.

serted through the skin into the patella, and great force used in the endeavor to lift it out of its lock between the bones. Author then by means of an extemporized windlass, strong enough, he thinks, to lift an ox, and a cord slung about the patella, tried to pull it away from its engagement, but again scored a failure. Then lifting the patella with one hand, and pulling on its upper edge in the direction of the thigh axis with the other, it turned with a sudden jerk and fell into normal position. The

windlass must have stretched the tendons, as the same manœuvre had been repeatedly tried before.

CASE IV.—SCHMIDT. *Centralbl. f. Chirurgie*, No. 41, p. 1023, 1900.  
 "Ein Fall von Luxation der Patella nach Abriss der Quadricepssehne."

On December 25, 1899, B., aged sixteen years, miner, fell, striking the knee on edge of a rail. Sudden pain above patella. Knee swollen and at right angle. Slight extension possible, but much pain. Under edge of patella points forward; above it a cavity admitting three fingers, in which can be felt the front (now upper) surface of the patella and con-



FIG. 6.—Sketch of Röntgen photograph accompanying Schmidt's case.

dyles of the femur. Upper border cannot be felt, because set in the space between femur and tibia. (Fig. 6.) Efforts to reduce unsuccessful.

Incision in perpendicular direction, seven centimetres in length over middle of the knee. Many clots removed from the joint. A finger was introduced behind the luxated patella from the side, and with exertion of considerable force it was lifted and returned to its position. The ruptured quadriceps tendon was not sutured, because this was regarded as a "complication" of the operation, and as preventing passive motion for weeks. Healing by first intention. Passive motion begun on eighth day. Entire recovery of all motions of the joint.

CASE V.—KUETTNER. *Zentralblatt f. Chir.*, No. 27, 1904, p. 168. "Demonstration eines Praeparates von horizontaler Luxation der Patella."

A woman sixty-four years old fell from wagon, receiving a penetrating wound of knee. Patella not to be felt. Suppuration of joint already begun. Amputation of thigh; death.

On dissection, patella found between outer condyles of femur and tibia, and rotated on its transverse axis. Quadriceps tendon, somewhat twisted, lay on outer surface of knee behind the femur, and had been perforated by the external lateral condyle. Articular surface of patella looked towards tibia. Ligamentum patellae intact. Lateral and crucial ligaments ruptured.

The mechanism of the injury, author remarks, must have been a forced adduction of leg, causing joint to gape widely, while patella luxated outwardly and was forced into joint.

This case is similar to Szuman's, except for the fatal addition of a penetrating wound of the joint; and in this the patellar facets looked downward, in Szuman's upward.

In reviewing these cases, reduction is seen to have been accomplished only once by manipulation alone (Deaderick). In Midelfart's, Szuman's, Schmidt's, and my own, it was necessary to open the joint in order to free the patella. All of the operative cases healed by primary union, and the usefulness of the joint was recovered.

Midelfart and Deaderick speak of this variety of displacement as "Downward Dislocation," a term which has been perpetuated by some recent writers on surgery. It is evident, however, that this designation is but partially descriptive, and includes too much. The essential and distinguishing feature, viz., rotation on the horizontal axis, is omitted, while other dislocations without rotation on either axis might fairly come under this head. A more precise classification of patellar luxations in general would, therefore, be: Dislocation upward or downward, outward or inward; dislocation with rotation on perpendicular or horizontal axis, and combinations of these varieties.

The cases reported by Midelfart, Deaderick, Schmidt, and myself were dislocations with simple rotation on the horizontal axis. Those of Szuman and Kuettner present a complex of horizontal rotation and outward displacement, and must have been produced by a combination of forces.